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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/549,267	09/13/2005	Volker Rasche	PHNL030288US	1659
38107	7590	11/30/2006		
EXAMINER				
COCHRAN, ANTHONY K				
ART UNIT		PAPER NUMBER		
2112				

DATE MAILED: 11/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/549,267	RASCHE ET AL.	
	Examiner	Art Unit	
	Anthony Cochran	2112	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 12 March 2004.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-18 is/are pending in the application.
 - 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-18 is/are rejected.
- 7) Claim(s) 6 is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 12 March 2004 is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 09/13/2005.
- 4) Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) Notice of Informal Patent Application
- 6) Other: _____.

DETAILED ACTION

Foreign Priority

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. EP 03100646.3 filed on **March 14, 2003.**

Information Disclosure Statement

The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered. See **page 2, [0014]** of the disclosure.

Specification

The disclosure is objected to because the specification refers to claims in the following sections, (**page 1, [0001], [0004], and [0005]**) which can create inconsistencies in the event of claims amendments.

The specification is objected to due to the following errors:

[0011] "in such manner" should read in such a manner and "these plural" should read **this plurality**. Appropriate corrections are required.

Claim Objections

Claim 6 is objected to because of the following informality:

In **Claim 6 line 3**, "*the object*" should read **said object** if referring to the instance recited in **claim 1** which this claim depends upon. Appropriate corrections are required.

The examiner has examined the claims as best understood as follows.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2-4, 6, 9, and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "substantially" in **claim 2** and is a relative term which renders the claim indefinite. The term "substantially" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The term "more advantageous" in **claim 6** and is a relative term which renders the claim indefinite. The term "more advantageous" is not defined by the claim, the

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specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, **claim 11** recites the broad recitation "*physical elements*", and the claim also recites "**such as markers provided on a stent delivery catheter or on a guidewire**" which is the narrower statement of the range/limitation.

Therefore, **claims 2, 6, and 11** are rejected for being indefinite. **Claims 3, 4 and 9** are also rejected for the above reasons by virtue of their dependency.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6, 10, 13, 14, 17, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by **Rasche et al. (WO 02/103639 A2)**.

With respect to **claims 1 and 18**, **Rasche et al.** discloses an X-ray CT imaging method and apparatus comprising:

- ❖ forming a set of a plurality of two-dimensional X-Ray projection images of a medical or veterinary object to be examined through a scanning rotation by an X-Ray source viz a viz said object, which X-Ray images are acquired at respective predetermined time instants with respect to a functionality process produced by said object (**items D_{ij} in FIG. 1 and page 5 lines 8-12**);
- ❖ reconstructing by back-projection a three-dimensional volume image of said object from the set of X-Ray projection images (**module 42 in FIG. 2 and page 6 lines 5-15**),
- ❖ deriving an appropriate motion correction for the respective two-dimensional images as based on a motion vector field, and subsequently

from the various corrected two-dimensional images reconstructing the intended three-dimensional volume (**item G in FIG.1, module 43 in FIG. 2 and page 5 lines 28-32**).

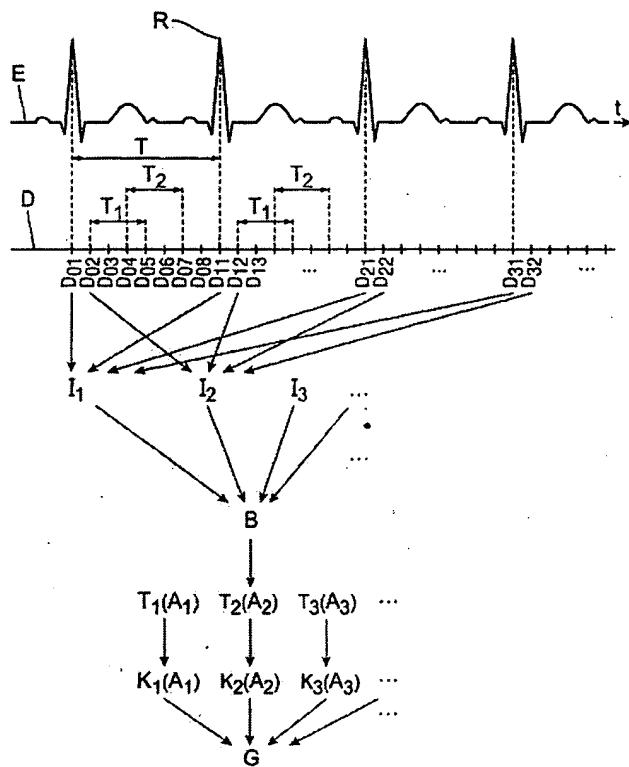


FIG.1

(Figure 1, reproduced from WO 02/103639 A2)

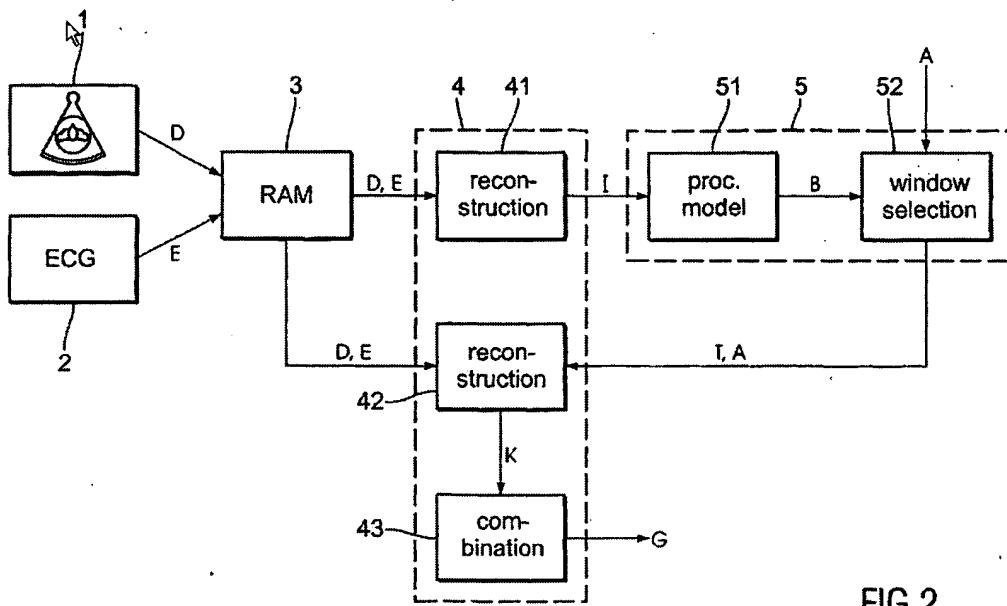


FIG.2

(Figure 2, reproduced from WO 02/103639 A2)

With respect to **claim 2**, **Rasche et al.** further discloses the method as claimed in claim 1, wherein said motion correction is derived from reference images that are acquired in corresponding instants of the movement of the object in question that is substantially periodic (items I_i in FIG. 1), and which reference images have substantially differing projection orientations (page 1 lines 12-15).

With respect to **claim 3, Rasche et al.** further discloses the method as claimed in claim 2, wherein said corresponding instants refer to corresponding phases of a cardiac movement (**page 1 line19**).

With respect to **claim 4, Rasche et al.** further discloses the method as claimed in claim 3, wherein said movement is derived from following one or more feature points of the object, such as bifurcation points (**page 3 lines 19-20**).

With respect to **claim 5, Rasche et al.** further discloses the method as claimed in claim 1, and being based on feature extraction for deriving said motion vector field (**page 3 lines 16 –22**).

With respect to **claim 6, Rasche et al.** further discloses the method as claimed in claim 1, wherein two-dimensional projections are corrected towards their calculated shape in a more advantageous phase of the motion by the functionality process of the object (**page 6 line 1-7**).

With respect to **claim 10, Rasche et al.** further discloses the method as claimed in claim 1, for use with a coronary artery with a stent in place and an artery wall section of said artery being under investigation ([**page 4 lines 28-29**]).

With respect to **claim 13, Rasche et al.** further discloses the method as claimed in claim 1, whilst deriving an amount of movement correction from a measured distance between an identified two-dimensional marker/feature position and a reference two-dimensional marker/feature position, or through an ECG analysis, or through a combination of the two methods (**page 5 line 15**).

With respect to **claim 14, Rasche et al.** further discloses the method as claimed in claim 1, whilst using built-in cardiac motion compensation for three-dimensional cardiac ROI reconstruction, and generating and overlaying multiple runs of a cardiac region whilst maintaining one or more markers at the same position, and by overlaying making the multiple cardiac ROI reconstructions (FIG 1 and **page 3 lines 16-25**).

With respect to **claim 17, Rasche et al.** further discloses the method as claimed in claim 1, and including one or more steps of the following sequence of steps: Acquiring a rotational angiography data set from a calibrated system; Reconstructing a low-spatial-resolution volume data set for a specific heart phase (**page 7 lines 15-16 and module 41 in FIG 2**); Estimating a three-dimensional centerline in the volume data; Forward projecting the volume data or the three-dimensional centerline into the successively acquired projections with different projection geometry; Using the forward projected volume or the centerline as an initial approximation for the correct motion-compensated projection for this viewing angle; Calculating a transformation matrix between the initial approximation and the real acquired projection at the current viewing

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angle; Transforming the acquired projection into the correct cardiac phase; Incorporating the additionally acquired projections in the three-dimensional reconstruction procedure by the successive application of the above on any or all appropriate projections.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 7-9 11, 12, 15, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rasche et al. as applied above, in view of Heuscher et al. (US Patent Publication US 2003/0007593 A1).

With respect to claim 7, **Rasche et al.** disclose the X-ray CT imaging method as recited in claim 1.

Rasche et al. fails to explicitly teach a separating an estimated motion of parts of said object into a non-linear temporal component caused by overall contraction within said object, and a linear temporal component caused by overall rotation within said object.

Heuscher et al. teach a method separating an estimated motion of

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parts of said object into a non-linear temporal component caused by overall contraction within said object, and a linear temporal component caused by overall rotation within said object ([0058]).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of **Heuscher et al.** in the method of **Rasche et al.**, since a person would have been motivated to “improve temporal and spatial resolution of images of moving anatomy” ([0020]) as explicitly stated by **Heuscher et al.**

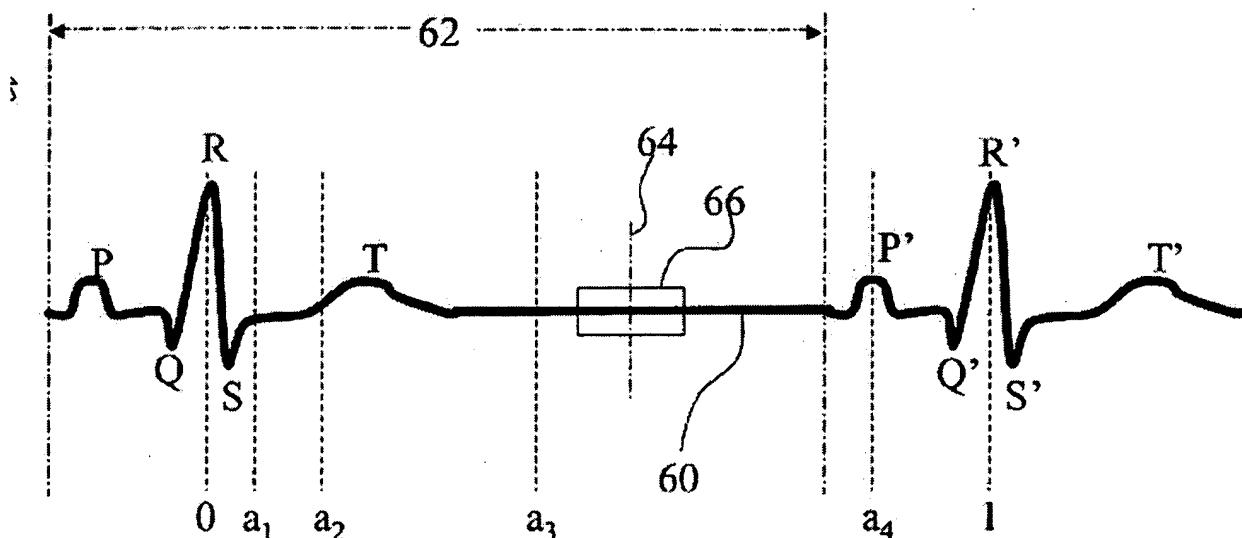


FIG 2

(Figure 2, reproduced from US 2003/0007593 A1)

With respect to claim 8, **Rasche et al.** disclose the X-ray CT imaging method as recited in claim 7 above.

Rasche et al. fails to explicitly teach a method particularly applied to coronary arteries.

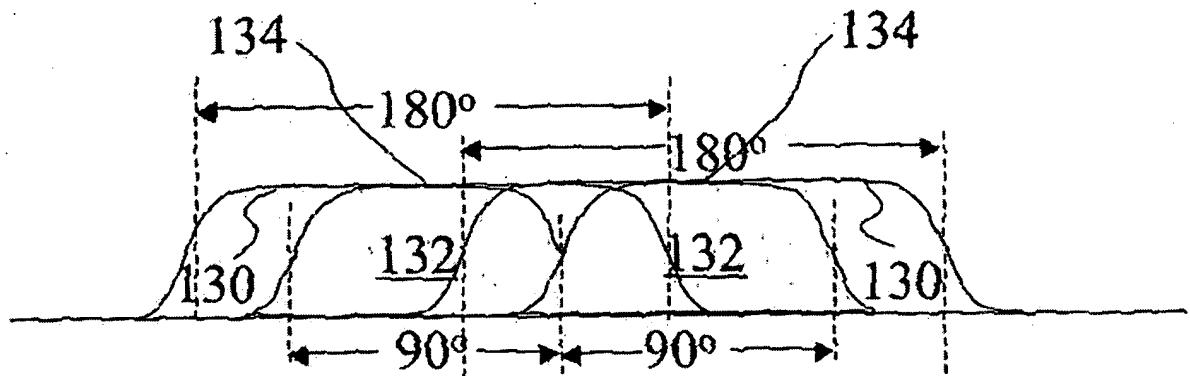
Heuscher et al. teach a method particularly applied to coronary arteries ([0073]).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of **Heuscher et al.** in the method of **Rasche et al.** since a person would have been motivated to "further recognize that the state concept is not limited to cardiac CT imaging or to cardiac dynamic volumetric imaging" as explicitly stated by **Heuscher et al.** ([0073]) lines 1-2).

With respect to **claim 9**, **Rasche et al.** disclose the X-ray CT imaging method as recited in claim 1 above.

Rasche et al. fails to explicitly teach wherein said projection orientations differ by an angle in a range between substantially 45 degrees and 90 degrees.

Heuscher et al. teach wherein said projection orientations differ by an angle in a range between substantially 45 degrees and 90 degrees (item 130 in FIG. 6C and [0081]).



(Figure 6c, reproduced from US 2003/0007593 A1)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of **Heuscher et al.** in the method of **Rasche et al.** to include the projection orientations that differ by an angle in a range between substantially 45 degrees and 90 degrees, since a person would have been motivated to have a method which "identifies a plurality of data acquisition windows in each cardiac cycle" ([0021]) as explicitly stated by **Heuscher et al.**

With respect to **claim 16**, **Rasche et al.** disclose the X-ray CT imaging method as recited in claim 1 above.

Rasche et al. fails to explicitly teach determining a temporal gating as being based on a three-dimensional resolving of a feature point location.

Heuscher et al. teach determining a temporal gating as being based on a three-dimensional resolving of a feature point location ([0063]).

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It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of **Heuscher et al.** in the method of **Rasche et al.** to include the temporal gating, since a person would have been motivated to have a method [which "improved accuracy of diagnostic information"] ([0022]) as explicitly stated by **Heuscher et al.**

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Rasche et al.** as applied above, in view of **Kehl et al.** (**Computers & Graphics 24 (2000) 731-739**).

With respect to **claim 11**, **Rasche et al.** disclose the X-ray CT imaging method as recited in claim 1 above.

Rasche et al. fails to explicitly teach a method deriving said motion correction from physical elements present in the object, such as markers provided on a stent delivery catheter or on a guidewire

Kehl et al. teach a method deriving said motion correction from physical elements present in the object, and such as markers provided on a stent delivery catheter or on a guidewire (**page 732, col 2**; i.e. "injects contrast agent").

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of **Kehl et al.** in the method of **Rasche et al.** to include application to coronary arteries since a person would have been motivated to "improve heart volume measurements" ([page 732 col 1 line 9]) as explicitly stated by **Kehl et al.**

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Rasche et al.** as applied above, in view of **Carroll et al. (US 6501848 B1)**

With respect to claim 12, **Rasche et al.** disclose the X-ray CT imaging method as recited in claim 1 above.

Rasche et al. fails to explicitly teach including in said correction an overall translation pertaining to said object.

Carroll et al. teach a method including in said correction an overall translation pertaining to said object (**col 4 lines 25-27**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of **Carroll et al.** in the method of **Rasche et al.** to include in said correction an overall translation, since a person would have been motivated to "improve reconstruction of 3-D images from 2-D image data and that a further need exists for improved QCA techniques utilizing such 3-D reconstruction to provide needed analysis in the intervention process" (**col 3 lines 5-10**) as explicitly stated by **Carroll et al.**

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Rasche et al.** as applied above, in view of **Koenig et al. (Dynamic Reconstruction for Radiotherapy Planning; 2002; CARS; pp. 521-526.)**

With respect to claim 15, **Rasche et al.** disclose the X-ray CT imaging method as recited in claim 1 above.

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Rasche et al. fails to explicitly teach generating a four-dimensional data set.

Koenig et al. teach a method including generating a four-dimensional data set (i.e. $f(M,t) = f(x,y,z,t)$).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of **Koenig et al.** in the method of **Rasche et al.** to include in said correction an overall translation as, since a person would have been motivated to carry out motion compensation in order to "avoid blurring" (page 522 section 2.2) as explicitly stated by **Koenig et al.**

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Cochran whose telephone number is (571) 272-9794. The examiner can normally be reached on Monday - Friday from 8:00am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Akm Ullah, can be reached on (571) 272-2361. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

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you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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